AMENDMENTS TO THE SPECIFICATION

Please replace the original specification with the enclosed substitute specification (in both clean and marked-up form).

Q-63642
Clean Version of
Specification
09/912,568

Process System and Process Tool for Processing a Workpiece

Field of the Invention

The invention relates to a process system and a process tool for processing a workpiece, more particularly in the field of automotive assembly, requiring a plurality of assembly operations on individual parts of a vehicle, for example a cylinder block or body. However, the invention is not restricted to automotive assembly, it instead being suitable for any environment requiring processing by an optional tool at a plurality of process sites.

Background of the Invention

please enter substitute specification

In industrial series production requiring implementation of a plurality of repetitive assembly operations, e.g. tightening nuts and bolts, it has become customary to automate the operations involved, i.e. tightening nuts and bolts as far as possible by employing automated tools. For example, a process system including a plurality of automated nut runners is lowered onto an cylinder head for bolting it down to the cylinder block in accordance with a predefined program. In this arrangement a process parameter programming means sets, among other things, each of the nut runners to a specific torque and/or torsion angle for tightening the individual bolts. Thus, by automatically marrying the cylinder blocks and cylinder heads, together with the process system, highly automated series production is achievable. In this case the process system itself is designed to customer specifications, i.e. the process system is tailored to the process operation to be implemented in each case so that, for example, any change in the shape of the workpieces, in this case the cylinder heads, a new process system needs to be designed.

On the other hand, there are process operations which permit handling by automated or robotic devices either not at all or only with difficulty. In addition, process operations exist for which, due to the timing cycle involved, automated assemblies cannot be put to use and thus single or multiple screw drivers or nut runners and other process tools are required for manual guidance. Thus, such process operations, in series production too, require the use of, for example in bolting, such tools as e.g. poke, offset or gunning screw drivers or nut runners or other manually guided multiple screw drivers or nut runners. Process tools of this type are likewise highly automated so that for each